REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Applicants have filed a petition under 37 C.F.R. § 1.181 requesting that Claims 11 and 12 be examined on their merits. This response has been filed pending the outcome of that petition.

Claims 13 and 15 have been amended to recite means plus function limitations. Claim 6 has been amended responsive to the rejection under 35 U.S.C. § 112 and now recites the third flow passage as being one through which gases from the first and second flow passages can flow so that the hydrogen-off gas may be discharged to the atmosphere. Claim 6 no longer refers to a mixing portion or mixed gases but simply recites that gases from the first and second flow passages can flow through the third passage. This rejection is therefore believed to be moot. Additionally, the claims have been clarified based on the objection found in paragraph 6 of the Office Action.

According to the feature of the invention set forth in Claim 1, a valve is disposed in a first flow passage which leads to a hydrogen-off gas exhaust port of a fuel cell and which may be opened or closed so that the hydrogen-off gas is allowed to flow into or is blocked from flowing into the mixing portion. Claim 50 similarly recites a relief valve which is disposed in the first flow passage and which allows the hydrogen-off gas to flow into the mixing portion. For example, referring to the non-limiting embodiments of Fig. 6, this may be exemplified by the valve 414 in the line leading from the fuel cell to the mixing portion 411. Providing a valve in the hydrogen gas flow passage leading to the mixing portion permits the intermittent connection of the flow passage to the mixing portion for eliminating impurities (paragraph bridging pages 13-14).

Claims 1, 8, 13-15 and 50 were rejected under 35 U.S.C. § 103 as being obvious over Boneberg et al in view of WO '993. According to the Office Action, it would have been

obvious in view the valve 7 in WO '993 to have provided a valve in the hydrogen-off gas flow passage of Boneberg et al in order to "utilize the supplied hydrogen to its fullest extent without waste." However this is respectfully traversed.

Boneberg et al teaches that hydrogen and oxygen off gases from a fuel cell may be combusted to provide heat to evaporate or superheat a hydrocarbon or hydrocarbon/water mixture to be fed to a reformer of a fuel cell system. Boneberg et al therefore discloses that the hydrogen and oxygen off gases mixed in the mixing portion 4 are combusted in the burner 3 to produce heat for the heat exchangers 1 and 5. As the Examiner has recognized, there is no disclosure of a valve in the line (first flow passage) providing hydrogen-off gas to the mixing portion 4. Indeed, one skilled in the art would not find it necessary to provide such a valve in this line to "utilize the supplied hydrogen to its fullest extent without waste." The hydrogen gas reaching the mixing portion 4 is not wasted since the heat energy therein is used in reforming the hydrocarbon fuel. Therefore, since the hydrogen gas reaching the mixing portion 4 is not wasted, the presence of a valve to cut off flow in the line providing hydrogen-off gas to the mixing portion 4 would not "utilize the supplied hydrogen to its fullest extent without waste." In fact, providing such a valve to cut off flow in the line providing hydrogen-off gas to the mixing portion 4 would reduce the efficiency of the reformer and would be undesirable.

WO '993 discloses a fuel cell system in which the hydrogen off gas from the anode 2 of the fuel cell 1 is discharged through a line 5 to a separator 8a. The line 5 has a valve 7. However the presence of the valve 7 in WO '993 would not have motivated one skilled to have provided such a valve in Boneberg et al. As already explained, such a motivation would not have arisen from a desire to "utilize the supplied hydrogen to its fullest extent without waste" since the hydrogen reaching the mixing portion 4 in Boneberg et al is not wasted. On the contrary, cutting off flow in the line providing hydrogen-off gas to the mixing portion 4

would reduce the efficiency of the reformer and would be undesirable. On the other hand, the present application teaches providing such a valve to permit the intermittent connection of the flow passage to the mixing portion for eliminating impurities, and represents an unobvious advance in the art. The aforementioned claims therefore define over Boneberg et al in view of WO '993.

Claims 6 and 31 were rejected under 35 U.S.C. § 103 as being obvious over Salvador et al. Claim 6 recites the features whereby the gas-liquid separator is positioned to separate out the liquid content of the gases from the first and second flow passages, and a catalytic reaction portion which can reduce the concentration of hydrogen in the gas from the gas separator is connected to receive gases, i.e., is downstream, from the gas-liquid separator. For example, referring to the non-limiting embodiments of Figs. 1 and 6, a gas-liquid separator may be found at 508 and a downstream catalytic reaction portion at 510. Salvador et al instead discloses a combustor 30 that receives off gases from a fuel cell 4, and a downstream condenser in which condensed water from the combustion gas is separated out to the return line 38.

However, not only is the Salvador et al combustor 30 not a catalytic reactor, but Salvador et al also teaches that the condenser 36 receives exhaust gases from the combustor 30 -- the opposite of the arrangement set forth in Claim 6. It was the position of the Office Action, in reliance on *In re Einstein*, 8 USPQ 167, that reversing the order of the combustor and condenser in Salvador et al would have been an obvious reversal of order involving only routine skill. However the rule in *In re Einstein* is not applicable to the present application. The relevant portion of this decision is set forth below:

> It is true Linton shows a different device for accomplishing the reciprocating movement, his means being a screw shaft which is caused to function by means of gears *which operate, in effect, the same as those of the appellant here*. Gordon shows a spindle operated by pulleys and belts, and has a cam follower and a cam groove *which operate in a like manner to those of the appellant*, namely, to move the spindle backward and forward. The elements,

> however, are arranged opposite to those of the appellant, that is, the outer element bearing the cam follower is attached to the spindle and moves with it, while the inner sleeve bearing the cam groove is stationary. The Patent Office holds that the transposition of these elements is obvious and does not constitute invention. In this we agree. (Emphasis added).

It is evident from the above excerpt from *In re Einstein* that the reversal of the order of parts was there deemed to be obvious because it did not affect the manner of operation of the device. Where, as here, the order of parts has a functional consequence, this rule does not apply and it cannot be held to be obvious to relocate the elements of Salvador et al without a motivation in the art to do so.

In fact, Salvador et al teaches against such a rearrangement. Combustion in the burner 30 produces water as a byproduct. According to Salvador et al this water is condensed and recycled to the tank 14 so that it will be available for the steam reformer 6 (col. 4, lines 24-49). It would make no sense for one skilled in the art to instead provide the condenser 36 upstream from the burner 30 for this purpose since another downstream condenser would then have to be provided for the water produced by the combustion in the burner 30. Moreover, there is no evidence that the moisture in the line 32 would be sufficient to flood the burner 30 in the absence of an upstream condenser; indeed, the absence of a condenser in Salvador et al suggests that this is was thought not to be a problem. Thus the reversal of the order of the combustor and condenser in Salvador et al would not have been obvious, and so Claims 6 and 31 define over Salvador et al.

Dependent Claim 13 recites a control portion adapted to control the valve, wherein the control portion includes means for opening and closing the valve at intervals of a relatively short period when delivering the discharged oxygen-off gas to the mixing portion. Dependent Claim 15 recites a control portion adapted to control the valve, wherein the control portion includes means for opening the valve if the concentration of hydrogen in the discharged hydrogen-off gas drops below a reference concentration. The Office Action

simply stated that a controller, *per se*, would have been obvious. However since these claims now recite means plus function limitations whose functions must be considered, and there is no teaching in the art for the claimed functions, these claims also define over the prior art.

Dependent Claim 14 further recites a flow rate-reducing portion which is disposed in the first flow passage between the valve and the mixing portion, which is able to reduce the flow rate of the hydrogen-off gas flowing from the valve. The Office Action states that a flow rate reducing portion would have been obvious in Boneberg et al so as not to overload the fuel cell. But in view of the fact that the claimed flow rate-reducing portion is disposed in a flow passage for off gas *from the fuel cell*, one skilled in the art would not limit the flow rate therein to prevent overloading the fuel cell.

Claim 21 recites a diffusion member which is disposed at an end of the exhaust flow passage and which can diffuse a gas flowing out from an opening at the end of the exhaust flow passage in the radial direction of the opening, and a valve disposed in the exhaust flow passage through which the hydrogen off gas is discharged to the atmosphere. Claim 21 had been rejected under 35 U.S.C. § 103 as being obvious over Salvador et al in view of WO '993 Heinen et al. However, as previously noted, no obvious combination of Salvador et al and WO '993 discloses a valve disposed in a hydrogen exhaust flow passage from a fuel cell. Salvador et al and WO '993 are directed to fuel cells for vehicles. Heinen et al, on the other hand, simply discloses a diffusion member 13 as part of an air supply tube 8 that is applied to a wall of a housing. It is respectfully submitted that one skilled in the art would not have considered Heinen et al to be analogous prior art and would not have found it obvious to have combined Salvador et al and WO '993 with Heinen et al. Claim 21 is therefore believed to define over any combination of the above references.

Claims 37-39 and 43 were rejected under 35 U.S.C. § 103 as being obvious over Boneberg et al in view of WO '993, and further in view of Shabaker which was cited to teach

a flow control orifice. However, while flow control orifices, *per se*, were known, there is no teaching in the art to motivate the use of a flow control orifice for the hydrogen gas off line of Boneberg et al. These claims therefore also define over the prior art.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early Notice of Allowability.

Respectfully submitted,

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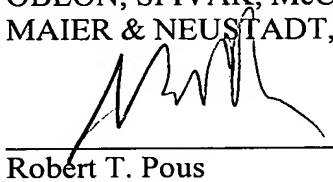

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